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ABSTRACT

A study was conducted to identify the potential health hazards of visual display terminals for employees and then to develop a list of recommendations for improving the physical conditions of the workplace. Data were collected by questionnaires from 55 employees in 10 word processing departments in Topeka, Kansas. A majority of the employees indicated that they have the correct ergonomic design in their departments, but others either did not have the correct ergonomic design at their workstations or were not aware of the potential of their workstations. Only a little over half said the lighting was good. Almost two-thirds indicated their desk heights were adjustable. Almost three-fourths said their chairs did not support the lower back. A majority of employees indicated that their keyboards were lower than a normal desk, their screen was adjustable, and their copyholders were at the same level and angle as their screens. Results showed that the employees seemed to exhibit many of the same areas of stress that other studies have documented, including monotony and repetitiveness, production quotas, promotions and raises, and heavy workload. The majority of health problems occurred rarely, or at the most, only occasionally. Eyestrain and headaches were reported most frequently. (The study instrument and 50 references are appended.) (YLB)

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THE VIDEO DISPLAY TERMINAL HEALTH HAZARD DEBATE

A Thesis Submitted to the Graduate School in Partial
Fulfillment of the Requirements for the
Degree of Master of Science

By

Carolyn A. Clark

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Pittsburg, Kansas

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Carolyn A. Clark

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CHAPTER I

INTRODUCTION

Ever since the introduction of visual display terminals (VDT's) into the workplace, there has been concern over the possibility of adverse effects on the health and well-being of the employees using them. The concern or debate, as it is often called, places the worker-safety groups and unions on one side and the equipment-manufacturing and industry associations on the other side.

Video display terminals (also known as CRT, Cathode Ray Tube and VDU, Visual Display Unit) have been accused of causing health problems that range from neck aches, fatigue, impaired vision and stress to miscarriages and birth defects. The debate continues over whether these problems are physical or psychological in nature.

The International Trade Union Guidelines on VDT's stated that by 1990 more than half of the workforce in industrialized countries and a significant proportion of the urban workforce in developing countries will regularly be using VDT's. The United States Department of Labor has estimated that by 1990, 40 to 50 percent of all American workers will be making daily use of electronic-terminal equipment. Industry experts are forecasting that by 1990, 75 percent of all American office workers will be working directly with computers. Alexander Cohen,

Chief of Applied Psychology and Ergonomics at the National Institute of Occupational Science and Health, reports there are 15 million to 19 million VDT's in the United States workplace. Mr. Cohen expects that number to increase to 40 million by the year 2000.

As the number of video display terminals used in the workplaces in industry and commerce have increased, so has the public concern over the possible adverse effects on the health and well-being of the employees using them. Much of the early research appeared to show that VDT users suffered more discomfort than the non-users experienced, but recent reports indicate that the VDT in itself may not be the cause of the problems.

In the early 1980's, concern spread about an increased risk of miscarriage or of having children with major birth defects among female VDT users. Public officials gave repeated assurances that there was no reason for concern, but the alarm continued to grow and the effects are still apparent today. This apparent danger to pregnancy quickly became and continues to be an issue between management and employees.

It does seem important to minimize anxiety of VDT users and to study whatever real problems may actually exist. Authorities in this area feel that anxiety can be minimized by more effective communications between scientists and the layman. Every attempt should be made to isolate and study any suspected problems. Effort should also be made by all concerned to avoid unconscious bias. Since there are many opportunities for speculation about the possibility of health hazards, it would be wise to continue research studies in this area.

Statement of the Problem

Video display terminals have been accused of causing health problems ever since they were introduced into the modern office. These health concerns can have an adverse impact on office productivity and efficiency.

This research study investigated two problems:

1. Are word processing departments in Topeka, Kansas, following the guidelines for ergonomics at the individual workstations?
2. If the word processing departments are following the recommended guidelines, are the VDT operators still experiencing health problems?

The first problem was to identify the most common concerns of the operators in regard to their physical and mental well-being in the workplace.

The second problem consisted of a list of recommendations for VDT operators which should increase their comfort and job satisfaction.

Need for the Study

The need for this study was to gather more information about the health effects that visual display terminals may have on word processing employees. If the complaints are valid and can be corrected with modification in equipment, environment or input by the operators, then business and the educational field should be made aware of the outcome of the study.

Purpose of the Study

The purpose of this study was two-fold. The first purpose was to determine if word processing offices in the Topeka, Kansas, area were using ergonomics to aid their employees. If the offices were using the correct ergonomic guidelines, are the word processing employees still experiencing any of the health hazards that have been concerns for others working on VDT's.

The second purpose of this study was to aid those employees in word processing departments in coping with the new technology in the business offices and to alleviate some of the common concerns that they may be experiencing. A list of recommendations was prepared to help alleviate any health hazards that have been encountered.

Delimitations

This research study surveyed employees who work with VDT's in word processing departments in the larger business offices of Topeka, Kansas. These companies included: Bank IV, Blue Cross/Blue Shield, Kansas State Department of Education, Kansas State Department of Printing, Kansas Power and Light, Menningers, Santa Fe, Security Benefit Life, Southwestern Bell and Victory Life Insurance.

Limitations

This research study was limited to the cooperation of the word processing employees and their supervisors who were involved in this study and to the response of these employees. Due to the nature of the topic surveyed, the outcome of this study was influenced by the openness and honesty of the employees as well as the length of time that an employee has worked at a VDT.

Assumptions

For the purpose of this research, it was assumed that the words utilized in the survey instrument were interpreted on a similar level by all individuals participating in the study. It was also assumed that the word processor operators who were surveyed in this study were a representative sample throughout this area.

Definitions

Blurred vision----------characterized by dimness or indistinctness.

Cataracts----------clouding of the lens of the eye.

Chemical reaction---------a product of a chemical process.

CRT----------cathode-ray tube, an electronic device in which a controlled beam of electrons is focused on a phosphor coating on the inside (screen) of an evacuated glass envelope to create visible images. This may also be referred to as a VDT.

Emission of x-rays--------flowing out of electromagnetic radiation.

Ergonomics----------an applied science concerned with the characteristics of people which need to be considered in designing and arranging things that they use in order to promote the most effective and safest interaction.

Error Statistics----------frequency and type of errors on documents.

Eye irritation----------itching, watering, stinging, and dry or gritty eyes.

Eyestrain----------caused by eye muscle fatigue.

Gigahertz (GHz)----------unit of frequency equal to one billion hertz.

Glaucoma----------a disease of the eye marked by increased pressure within the eyeball that damages the optic disk and results in gradual loss of vision and ultimate blindness.

Headaches----------pain inside the head.

Heat----------a form of energy associated with molecular motion.

Hertz----------a unit of frequency of a periodic process equal to one cycle per second.

Infrared radiation--------light rays with wavelengths longer than those of visible light.

Ionizing radiation--------x-rays, gamma and cosmic rays above 100,000 GHz in the electronmagnetic spectrum.

Keystroke count----------counting of characters, numbers and symbols that are typed within a certain time frame.

Kilohertz (kHz)----------unit of frequency equal to one thousand hertz.

Microwaves----------a very short electromagnetic wave.

Modular furniture---------furniture that replaces the stationary desk. The work surface, counters, overhead storage can be rearranged quickly and inexpensively as the need arises. Chairs adjust for the comfort of the workers.

Musculoskeletal problems--includes shoulder, neck, back, arm, hand, wrist and finger pain.

Negative ions----------negatively charged atoms.

NIOSH----------National Institute for Occupational Safety and Health.

Non-ionizing radiation----radar, microwave and radio frequencies below 100,000 GHz in the electromagnetic spectrum.

Production quotas---------a minimum required amount of acceptable printed documents within a specified time frame.

Tracking breaktime--------how often and how long breaks are taken.

Ultraviolet radiation-----light rays with short wavelengths and high amount of energy as compared to visible light.

Ultrasound----------mechanical energy having a frequency above the normal limits of human hearing of 20 kHz.

VDT----------video display terminal, equipment used to display information that has been stored, or is being processed, electronically.

VDU----------video display unit. These are often referred to as VDT's.

Visual fatigue----------eye sensations including pain, fatigue and blurring, or other difficulties with vision.

WP----------word processing, which normally involves entering, editing and revising text.

Workplace dangers----------extrinsic factors occurring both within and outside the occupational sphere.

Workplace stress----------psychosocial adversity.

Workstation----------an area with equipment for a single worker.

Significance of Study

The significance of this study was divided into two areas. The first area of significance was to identify the potential health hazards for employees and then to develop a list of recommendations for improving the ergonomics of the workplace. The second area of significance was to provide educators with information which would allow them to better prepare business students for the electronic office and the technologically demanding jobs of the future.

Organization of the Study

This study has been organized as follows:

Chapter I: introduction for the study.

Chapter II: review of selected literature.

Chapter III: research methods and data collection procedures.

Chapter IV: presentations and analysis of the data collected.

Chapter V: summary and conclusions of the study.

Chapter VI: general recommendations.

CHAPTER II

REVIEW OF LITERATURE

History of the VDT Debate

Concern over industrial health and safety dates back many years. Both government standards and union contracts have provided guidelines for safeguards against some of the hazards.

With the introduction of VDT's into the workplace, the full extent of health dangers to employees are not yet known. But, "as the number of visual display terminals used at workplace in industry and commerce has increased, so has public concern over the possibility of adverse effects on the health and well-being of the people using them." (15,347) Since the early 1970's, a number of studies have been completed on the health hazards of VDT's.

Many of the early studies appeared to show that VDT users suffered more discomfort than non-users. However, the recent reports indicate that the VDT is itself not the cause. (15,347)

Investigations have been conducted by private industry as well as federal agencies. Other governments (Sweden, the Federal Republic of Germany, Canada, Belgium and Austria) have all initiated VDT studies. (41,26)

In 1979 a study showed that stress and resulting fatigue to VDT users did not differ in magnitude from other work groups. Instead, it seems that the higher the level of monotony, the higher the level of fatigue was reported. (43,1)

In the early 1980's, concern spread about the possibility of an increased risk of miscarriages or of having children with major birth defects as a result of exposure to VDT's. "Despite repeated assurances by public officials that there was no reason for concern, the alarm grew, leaving effects that are still apparent today." (11,163)

In July of 1980, four Canadian women who had been exposed to VDT's had children born with birth defects. The apparent danger to pregnancy quickly became an issue between management and employees.

In 1981, the VDT issue surfaced in many state legislatures. The first VDT bill was introduced in Maine, but it did not advance beyond the hearing stage. By 1983, legislation on VDT's had been considered in Massachusetts, Connecticut, New York and Oregon. Maine and Connecticut had enacted legislation in late 1983 calling for a study on the health and safety effects of the VDT's. Visual Display Terminal legislation was considered in fifteen states in 1984, but no regulatory legislation was enacted. (37,7)

In 1983 Canada surveyed more than 2,000 VDT's and found that the levels of x-radiation were extremely low and in the overwhelming majority of cases unmeasurable. The studies revealed that "Emissions of x-rays, microwaves, and ultraviolet and infrared radiation were very low or undetectable." No toxic chemicals were found in either source. The United States Army Environmental Hygiene Agency at the Defense Logistic Agency also failed to locate any obvious sources of the problem. (11,163-4)

In September of 1984, 9 to 5, a research organization devoted to the study of VDT operators, identified thirty-two VDT-worker related

compensation claims, a number of which were group claims--cases in which several employees of a single employer sought compensation for the same type of injury. Twenty of the claims had been settled and twelve were still pending. Seventeen of the settled claims involved musculoskeletal damage or strain (tendonitis, carpal tunnel syndrome and general muscular problems). All were successful in obtaining workers' compensation. (6,12-13)

The Department of Labor in 1985 indicated that the impact on workers is in a preliminary stage of development and in some cases there just was not enough data to fully analyze or assess the issues. However, the manufacturers still felt that there was little inherent danger in the technology. But terminal users consistently reported vision problems, muscular problems such as back, neck and wrist pain and mental stress. (2,2)

In 1986, twenty-two states initiated legislation that business offices using VDT's have guidelines to follow. It was felt that by 1987 most states would be introducing legislation to regulate the use of the VDT's in the business office. (29,104)

In June of 1987, Suffolk County, New York, passed a bill that required firms with twenty terminals or more to give employees who work at least 26 hours a week on the machines free annual eye examination, eyeglasses when necessary and rest periods every three hours. It also set standards for lighting, types of screens and equipment. (29,104) There was controversy over this legislation since it was felt that if the risk is high in larger companies, the risk in smaller companies should also be considered. A good health bill should protect everyone's health.

This bill was subsequently vetoed by the County Executive Michael La Grande. (38,369)

The University of Michigan conducted a study in 1985 and 1986 that showed a slight increase in miscarriage rates among workers who operated VDT's more than 20 hours per week. This study will continue to produce results in 1987, but it is a small study and cannot attempt to explain what aspect of VDT work might be the cause of increased miscarriage rate. (18,11)

A second United States study of VDT use and miscarriage rates is underway at the National Institute for Occupational Safety and Health. This is a federal research program. The study was first announced in 1982, but it has been delayed repeatedly and weakened by the telephone company's (the proposed research group) resistance as to who will be used in the study. (28,11)

In December 1988, Tim Friend of USA Today reported that "The VDT issue may be resolved sooner: One of the most important new studies to examine VDT's and miscarriage rates should be completed next summer or fall." He states that previous studies of the VDT's and stress have shown either ". . . no link or only a weak association with miscarriage rates. Often clusters appear to have happened by chance." (13,1)

A third study is being planned by researchers at the Mount Sinai School of Medicine in New York City. The New York Committee for Occupational Safety and Health feels that this study is the most ambitious of the three but almost two years after it was announced, the project is still in need of funding. (28,11-12)

While some of the completed studies will be extended or replicated and may produce more data, the New York Committee for Occupational Safety and Health states that we will have to wait at least until 1990, and probably longer, for useful new information. (28,11)

The worry about a possible associated health peril to those who work with VDT's has been treated by both individuals and labor organizations. (39,6) There is a need to make sure that automation enhances the quality of worklife for the employees who work in office settings. It must be understood what the electronic offices mean for the men and women who work in them--what they offer workers and what they demand. So while the debate continues,

> ". . . workers continue to be concerned about the safety of VDT's, employers are reluctant to curtail their use until they have conclusive evidence that they are harmful, and the government maintains a position of helpful and constructive neutrality." (39,8)

Health Hazards

The popularly perceived sources of health hazards attributable to VDT's can be classified into eight categories: ionizing radiation, non-ionizing radiation, negative ions, ultrasound, chemical, heat, workplace stress and workplace dangers. The first six of the eight factors do not seem to be the cause for health-related concerns since studies generally conclude that the levels are so low as to be insignificant. But not all models and makes of machines have been tested nor have all of the test results been in agreement. Test results pertain to individual machines, consequently, clustering of devices, in certain instances, could produce differing results. (39,9)

The last two categories, workplace stress and workplace dangers, do play an important role in the workplace and may be cause for health-related concern. "A number of health problems have been attributed to VDT use and some general conclusions can be drawn." (39,9)

Visual Problems

Visual dysfunction ranges from temporary acute effects such as eye irritation, visual fatigue, blurred vision and headaches to concerns about chronic visual disorders such as cataracts or glaucoma.

An unfortunate aspect of research on the VDT-induced visual fatigue is that no objective measure has been found that consistently correlates with the subjective reports of visual fatigue. (3,457) Although the reports of visual fatigue are widespread and affects more than 50 percent of the operators, the lack of a consistent objective measure has hampered research.

The National Institute for Occupational Safety and Health has measured ultra-violet radiation from three different types of VDT's. They report that the ultra-violet radiation was a hundred thousand times less than the American standard for office workers. (26,21)

The April, 1983, Harvard Medical School Health Letter stated that more than half of all VDT operators do complain of eye problems. Approximately 10 to 15 percent of the operators have almost daily eye pain or irritation, while 40 to 50 percent have occasional impairment. (6,10)

The 9 to 5 National Association of Working Women has reported that eye problems are the single most frequent health complaint of VDT users. These problems result from long hours spent staring at a flickering

screen. This is also compounded by characters barely legible on the screens, improper lighting and glare. (25,11)

A 1985 study by New York State employees found that the prevalence and severity of eye problems were in relationship to the time spent working on a VDT and not to the type of task performed. (25,11) It is felt the lighting design, more than anything else, determines whether the office is comfortable and functional for the VDT operation.

Another frequently cited problem with VDT's is the glare. This is caused usually by improper placement of the VDT in relationship to light sources. Glare results from inappropriate room lighting. It is recommended that lighting for a VDT department should be about half that needed in an office without terminals. The reason for this is to maximize the contrast of the screen. Proper illumination is essential so that both the VDT screen and the hard copy can be read without undue visual discomfort or fatigue. Visual discomfort and fatigue can also occur if the eye is exposed to large contrast variations, too much light, unclear display characters, or cathode ray tube flicker. (24,39)

Another cause of eye irritation is that the eye has to change focus fairly often. It is estimated that VDT operators have between 5,000 and 10,000 movements per day between input material and the screen. Differences in the brightness of the two mediums cause problems. Variations in the distance of the two sources cause eyes to tire as they constantly attempt to adjust from one source to the next. (47,23)

Flickering and/or poor screen images are another problem for eyes. Headaches and fatigue are the usual results. This can cause high absenteeism, high turnovers and low morale.

NIOSH recommends a 15-minute work-break be taken after two hours of continuous VDT work for "moderate" visual demands and a 15-minute work/rest every hour for "high" visual demands. (31,60)

Eyestrain has become an everyday problem for the VDT operator but it can be avoided if job design, office environment and vision are modified. There is no evidence that VDT's can cause permanent eye damage or threaten vision, even when eyestrain becomes a daily occurrence. (47)

Musculoskeletal Strain

The National Research Council feels that musculoskeletal problems rank second only to vision problems for VDT operators. (25,13) VDT operators have complained of musculoskeletal problems, including shoulder, neck, back, arm, hand, wrist and finger pain. In a study in Wisconsin state agencies, it was found that VDT operators who have the most regimented and physically demanding tasks (data entry, word processing and file maintenance) were significantly more uncomfortable than were the nonoperators studied: neck and shoulder pains (80 percent vs. 45 percent); backache (73 percent vs. 54 percent); burning eyes (75 percent vs. 49 percent); eyestrain (76 percent vs. 51 percent) and headaches (82 percent vs. 47 percent). (6,11) The arm- and hand-related problems in this study stem from repetitive motion while the neck, shoulder and back region came from the sedentary nature of the job, the design of the equipment and the posture of the operator. Two kinds of muscular problems have been identified: static posture--a result of maintaining the same posture over a period of time and repetitive strain injury--a result of performing the same physical activity rapidly over a long period of time. (25,13)

A 1983 National Academy of Science report attributes musculoskeletal problems to poorly designed workstations. (25,13) Several factors appear to contribute to the muscle strain reported by VDT operators.

1. Keystroke rate--rate a job task requires. Keying puts a load on the fingers, hands, wrists, arms and shoulders that increases as the speed of keystroke increases.
2. Keyboard height--excessive keyboard height can lead to musculoskeletal fatigue due to the need of the operators to keep their hands in an elevated position.
3. Body position--increased loads on the postural muscles due to the positioning of body parts. The VDT screen typically sits on a worktable (a desk) in a vertical plane to the tabletop. Operators tend to shift their posture to view the VDT screen and this creates a potential muscular loading problem.
4. Workstations--height of the working surface influences the height of arms, wrists and hands as well as wrist and neck angles. A majority of VDT operators are exposed to undue muscular loads due to poorly designed or improperly used workstation furniture. (36,24)

Stress

Dr. Michael Smith, a NIOSH psychologist, stated that "VDT operators have the highest stress jobs we've ever seen--and we've been in the stress business for ten years." (35,307) The National Institute for Occupational Safety and Health also revealed in one of its surveys that clerical workers assigned to VDT's showed higher stress levels than air

traffic controllers. (10,248) The 9 to 5 group cites psychosocial stress as ". . . the least visible, but potentially the most insidious, health problem faced by VDT workers." (25,13) A number of interacting factors including job task related features (job content, task requirements, and workload) and environmental factors (lighting and workstation design) contribute to the observed levels of job stress and health complaints.

The working conditions that lead to stress problems reported by the clerical VDT operators are not entirely related to the VDT use, but are also related to the entire work system that goes along with using VDT's. In the case of the clerical VDT operators, the computer system technology under which they work was designed without regard to the "human" factor in the system. (44,7)

Offices can become "paper factories" with clerical assembly lines. This can lead to job boredom and job dissatisfaction. Some employees may see themselves in a highly controlled work environment that demands high productivity. The practice of counting keystrokes and unannounced performance monitoring can be extremely stressful to the employees. There is little regard for individual preferences and abilities, no room for creativity with the computers. Some employers track breaktime, count keystrokes and record error statistics. (35,306)

NIOSH has estimated that approximately two-thirds of American VDT operators are electronically monitored to determine work speed, accuracy and efficiency. (14,57) Studies have found that ". . . 43 percent of the VDT operators studied reported anxiety aggravation and 40 percent reported depressive disorders" and ". . . a number of stress-related

symptoms in VDT operators that varied with the type of VDT activity." (36,25)

S. L. Sauter, Department of Preventive Medicine at the University of Wisconsin, found that ". . . clerical VDT users in their study experienced more work pressure, less job autonomy and more management control than clericals not using VDT's." He goes on to report that this suggests that factors beyond VDT use and/or reported levels of stress might influence psychological disturbances. (36,25)

Pregnancy

One of the most feared health hazards associated with VDT use is that of reproductive harm caused by exposure to radiation emissions. To date, no conclusive data have been established that the VDT use has a negative health effect on pregnant women. (38,365)

Scientists cannot say positively whether VDT's cause reproductive health problems. On the one hand, VDT work does not seem to expose pregnant women to chemicals or other agents that are known to be harmful to the fetuses. On the other hand, new research suggests--though it does not prove--that there may be a link between VDT work and problem pregnancies. (28,10)

There have been reports of "clusters" of problem pregnancies among VDT operators in the United States, Canada, the United Kingdom, Denmark and Japan.

> High numbers of miscarriages, birth defects, and other pregnancy-related problems have been reported among groups of female VDT operators at a Canadian newspaper, a San Francisco airline reservation office, an Atlanta data-processing center, and a Dallas computer center. Nonetheless, many industry and health experts believe that these problem-pregnancy clusters represent mere statistical accidents, rather than the effects of VDT exposure. (38,365)

The National Association for Working Women, however, has challenged the "randomness" of the findings. Overall, work in this area seems to be generally inconclusive and heavy with methodological concerns centering mostly on issues of inquiry control, reliability and validity. (39,10)

As a result of continuing concerns and debate, the National Institute for Occupational Safety and Health has begun a study to examine whether exposure to VDT's does have adverse effects on pregnant women. Employees at the Bell-South Corporation will be used for this study. Because this study is of such controversial nature, it has been postponed for years by criticism and debate. In fact the New York Committee for Occupational Safety and Health feels this has been delayed repeatedly and weakened by the telephone company's resistance to the study and is, therefore, unlikely to show us convincingly whether a risk does exist. (28,12)

However, research in this area continues. In December of 1988, Teresa Schnorr, with the National Institute of Occupational Safety and Health, stated that "There is a lot of activity in this field now as to what effects VDT's, stress, chemicals and other things might have on pregnancy." (13,1)

Schnorr is studying about 2,500 telephone operators--half who work with VDT's. She further states:

> There are three theories proposed to explain miscarriage rates among VDT's--ergonomics (comfortable work station), stress and non-ionizing radiation. We're focusing primarily on non-ionizing radiation because it would be too difficult to look at the other factors as well. (13,2)

The possibility of an emotion stress link is being presently studied by Dr. Maureen Hatch, an epidemiologist at Columbia University, New York. The results should be out within a year and final conclusions in about two years. Dr. Hatch has stated "I think stress and its effect on pregnancy has been regarded as sort of an old wives' tale." (13,2) A research study completed at the University of Michigan further reported "The USA's first wide-ranging study of how VDT's affect pregnancy did show that it is highly unlikely there is any link between the machines and miscarriages." (9,25)

A University of Michigan study showed that there was no higher miscarriage rate among women who spent 20 hours or less a week at a VDT than women with no exposure. There was a slightly higher than normal miscarriage rate for the women working more than 20 hours a week at VDT's. But the increase was not statistically significant. (9,25)

A survey by Japan's General Council of Trade Unions found that "over one-third of pregnant women working at computers video display terminals have problems during pregnancy or at delivery." This union has 45 million members. The survey covered 13,000 workers of which 4,500 were women. It included 250 woman who became pregnant or gave birth after working with VDT's. The average time in front of the screen was 2 years and 7 months. Of these women, eight had miscarriages, eight had premature births and five had still births. Among pregnant women who worked for 6 hours a day or longer in front of a VDT, two-thirds had problems with pregnancy or labor. Only 46 percent of the pregnant women who worked 3 to 4 hours a day in front of a VDT had problems, while only

one-fourth of the pregnant women experienced problems when working less than one hour a day at the VDT. (17,7)

In the same article that reported on pregnant women in Japan, the British government was reported as having claimed that it could find no evidence that video display terminals affect pregnancy. The article further emphasized that 15 percent of pregnancies end in miscarriages in the general population. This report felt that high rate of miscarriages among pregnant women working with VDT's are probably the result of statistic anomalies. (17,7)

Until there is more research, pregnant women, as well as those attempting to get pregnant, will continue to worry whether their VDT work will harm their babies. "Unfortunately, this worry can heighten the women's stress levels and increase the chances of abnormal pregnancy outcomes." (28,12)

Ergonomics

"It is believed that these health concerns [headaches, backaches and eyestrain] are caused--for the most part--by the user's work environment and not the VDT's." (9,24) These problems can be remedied by altering the worker's environment and work routine. Recent studies have shown that these health concerns are more likely caused by poor lighting, poor posture, too few breaks and inappropriate furniture." (9,24)

It has been established that ergonomically sound workstations are an invaluable weapon in the battle against VDT-related health problems. (33,41) Designers that apply this science (ergonomics) attempt to reduce operation fatigue and other forms of discomfort, both physiological and psychological, for employees working with VDT's. (8,4)

Inadequate design of the machine-human interface produces physical discomfort which, at a minimum, discourages the use of the new technology. In the extreme, the discomforts may lead to health problems. The designers need to take special care to make the workstations safe and comfortable. An ergonomically designed workstation must be able to be adjusted properly for each individual employee. The key to adapting the VDT to the operator is maximal adjustment of screen, keyboard and source document. (31,60)

Financial interest and workplace design are associated. There is a cause and effect relationship: "If one assures that persons are comfortable and remain healthy as they work with the tools of their profession, one can reap economic dividends." (22,331)

Recent studies support this association. Furniture manufacturers have found that "ergonomically designed" furniture can increase productivity by 10 percent over conventional furniture and in studies by the United States government, it was found that productivity increased almost 25 percent for operators using "best design" over operators using "worst design" for VDT workstations. (22,331)

Furniture concerns include the desk, chair, copyholder and footrests. Desk should be height adjustable and should allow independent adjustment of screen and keyboard heights. Chairs should provide proper back support and allow freedom of postural movement. (36,25) Chairs that are too high leave the legs dangling above the floor which places a strain on the lower back and causes the chair to limit blood circulation to the legs. (28,32)

Light sources such as windows and overhead light fixtures are potential sources of glare when working in front of a VDT screen. If the terminal is placed directly in front of an unshaded window, the brightness will force the eyes to constantly react and adjust. When placing the glare sources directly behind the worker, there is reflections on the screen making it difficult to read. (8,5) Lighting conditions in many offices are too bright for continuous VDT viewers. Lighting needs to be controlled with drapes or dimmers.

Copyholders should be adjustable in height and placed to reduce the number of head and neck movements, thereby reducing muscular strain on the neck, shoulders and back. Footrests should be available to all VDT operators who need them.

Equipment concerns would include the quality of the VDT models and the keyboard. "A detachable keyboard is recommended so that the keyboard and screen can be independently adjusted." (31,60)

Business needs to view ergonomics as a productivity and health tool that will reduce the complicated stressors arising from VDT operations. When business conscientiously and thoroughly apply ergonomics to the workplace, companies then can address both the productivity and the health factors necessary for true success in the automated office environment. (14,61)

Legislation

A great deal of VDT-related legislation has been introduced in state legislatures across the country, although few measures have been

enacted. (38,369) Most forms of proposed VDT legislation can be divided into four categories:

1. Measures that would provide VDT users with new rights to protect against safety and health hazards.
2. Proposals that would regulate the design of VDT workstations.
3. Bills that would address the design of the VDT itself.
4. Proposals to initiate studies to determine whether legislation regulating VDT's in the work place is warranted. (38,369)

Union groups have been active in bringing VDT hazards to the legislative front. The Service Employees International Union, the Newspaper Guild, the Communications Workers of America, and the Office and Professional Employees International Union were all active participants in Congressional hearings on VDT safety. Industry representatives have generally opposed such measures on the grounds that no scientific basis for regulation exists and that such restrictions would be expensive, reduce productivity and deprive those concerned with the benefits of technological improvements. (38,369)

Those states that have passed measures authorizing in-depth studies of the effects of VDT's are Connecticut, Maine, Rhode Island and Nebraska. (38,369) Other jurisdictions have legislation related to VDT health and safety currently pending.

In Oregon, a bill passed by both the House and Senate would have imposed mandatory safety standards on VDT's purchased for use by the state and the local government agencies. This bill was vetoed by the governor. A Maryland bill that would have required state agencies to take ergonomics into account when purchasing equipment for VDT terminals

and requiring the state to devise standards regulating the use of VDT's was defeated in 1986 by the Maryland General Assembly. Washington, California, Massachusetts, Wisconsin and New Mexico have all issued guidelines for VDT use by their state employees.

The federal level has had considerably less activity. There have been no federal laws specifically related to VDT-related hazards. Although there have been Congressional committee hearings on the subject. In a hearing in 1985, Dr. J. Donald Millar, director of NIOSH, testified that

> Radiation dangers appear to pose no threat to operators and that stress-related problems could be minimized through alterations in job structure and workstation design. Nonetheless, he recommended reliance on NIOSH-developed voluntary guidelines for VDT operation, including regular vision examinations, interruption of work periods with rest breaks and other job activities, and the incorporation of maximum flexibility into work station and terminal design. (38,370)

The committee concluded that the problems related to ergonomic factors do not warrant the imposition of legislatively developed and mandated standards and/or rules and regulations. Furthermore, the committee felt that such legislative standards would be so restrictive that they would inhibit the flexibility of employers and employees in getting the best use of VDT's. (38,370)

In contrast to the United States, fourteen foreign nations have implemented a wide range of legislation, safety and health requirements, or collective bargaining agreements regulating the use of computer terminals in the working environment. Most of this is concerning employees who use computer terminals more than 20 hours per week. (14,57) Advocacy groups to promote safe office technology have been very

successful in keeping VDT-related health issues before legislative and regulatory offices.

Summary

It is a fact that video display terminals have become important tools in the workplace. So, too, is the fact that VDT's are probably safe but still continue to be feared by many workers who believe they can cause vision problems, musculoskeletal problems, and stress which can lead to miscarriages and births of deformed infants among pregnant women.

The full extent of the dangers of "high tech" office work are not yet known. Health and safety hazards for office workers seem to be serious and are widespread. "Constant sitting in poorly designed chairs, a stressful work pace and tight deadlines--these were once accepted as 'just part of the job.' Now these working conditions are recognized as potential hazards to office workers' health." (46,1)

There is a growing consensus of opinion that appears to recognize that the perceived problems related to VDT's are related to the job design and the policies of the individual employers rather than to the machinery itself. (38,371) Ergonomics, not radiation, is the new buzzword. (32,41)

Legislation is continually being initiated for better working conditions so that we can see that substantial progress is being made in this area. The expectation is that the discomfort associated with the VDT's will continue to diminish in the years to come.

Developments in this field should be watched closely and corrective action taken when and if required. Job stressors showing the

greatest impact on VDT operators, such as workload, work pace, work pressure, boredom, less peer cohesion, lack of control over job activities and concerns about career development, should be monitored. With the health hazard issues still not clear, prudence should be among the watchwords of both the employer and employee alike. (39,13)

CHAPTER III

RESEARCH DESIGN

Organization of the Study

The researcher identified ten word processing departments in the city of Topeka, Kansas, that were involved in the study. A questionnaire was prepared for the word processing employees in these departments. This questionnaire surveyed ergonomics, stress factors and health problems that were present in selected offices in the Topeka area. A pilot test to validate the instrument was conducted on this questionnaire in business offices in Yates Center, Kansas.

A letter was mailed to each word processing supervisor in the ten departments in Topeka asking their assistance with the study. This mailing included a reply form to the researcher, a cover letter and survey questionnaire to the word processing employees, and a self-addressed stamped envelope. Samples of these instruments are included in Appendix A. Both the supervisor's and employee's letters explained the purpose for this study. Completion of the instrument was on a voluntary basis and it was indicated that absolute confidentiality would be guaranteed.

When the researcher failed to receive a reply from a supervisor, a telephone call was made directly to the supervisor. Upon receiving a positive answer from each supervisor, the number of letters and questionnaires that were requested were mailed to each individual department. The supervisors were then asked to distribute this information to their employees. With this second mailing, a different questionnaire

was sent to each supervisor. This instrument is also included in Appendix A.

This study tried to determine whether ergonomics guidelines are being used in these ten departments and, if so, are health problems still being experienced by the employees.

Collection and Processing of Data

A week after the final mailing to the supervisors, the researcher collected the questionnaires in person from each supervisor. The results were tabulated to show whether ergonomics are being used in the word processing departments and, if so, are health problems still being experienced by the word processing employees.

The results are summarized in tables and explained in narrative. It is the hope of this researcher that the data depicts the extent to which ergonomics is being used to assist employees in the office and whether or not health problems have been experienced.

CHAPTER IV

RESULTS OF SURVEY

The questionnaires were mailed and then collected from each of the ten word processing departments as stated in Chapter III. The questionnaire primarily covered the ergonomic designs of the employee's workstations, and the stress and health problems employees encounter when working at VDT's. The results of the survey have been summarized in tables and explained in narrative form.

All ten of the word processing departments contacted agreed to participate in the study but only nine supervisors returned completed questionnaires. Therefore, 90 percent of the word processing departments that were initially contacted participated in this study. Fifty-five questionnaires were sent to these nine supervisors for their word processing employees to complete. All of these were collected by the researcher. Not all employees answered every question on their questionnaires; therefore, the results of the study will be based on the total number of responses to each individual question.

The word processing departments ranged in size from one to sixteen employees. The employees and supervisors have been operating VDT's from under one year up to and including seventeen years.

Question No. 1 on the survey instrument asked the employees to rate their present health condition in comparison with their health before they began working at a VDT. Thirty-four employees (64 percent) rated their overall health as being the same as it was before they were employed at their present job. Five employees (10 percent) responded that

their health was better while fourteen employees (26 percent) felt that the condition of their health was worse.

The review of literature had indicated that stress and health problems are related to the length of time the employee spends in front of a VDT each week. Question No. 2, therefore, asked the employees how many hours a week each spends at the VDT. All fifty-five employees completed this question. Thirty-four employees (62 percent) spend 30 to 40 hours a week at a VDT while another ten employees (18 percent) spend 40 or more hours a week. Six employees (11 percent) responding work at the VDT less than 20 hours while another five employees (9 percent) work only 20 to 30 hours. Therefore, forty-four employees (80 percent) who participated in this study are working at a VDT 30 or more hours a week.

Question No. 3 was used to compare the pressure experienced by an employee who has worked both on an electric/electronic typewriter and on a VDT. Fifty employees responded with twenty-two (44 percent) stating that they were experiencing less pressure while working on the VDT than they had experienced while working on an electric/electronic typewriter. Nineteen employees (38 percent) indicated that they felt about the same pressure on a VDT as they had experienced on an electric/electronic typewriter while only nine employees (18 percent) indicated that they were under more pressure while working at a VDT.

Questions No. 4, 5 and 6 were included in the instrument because the researcher was concerned about the ergonomic design of the workstations. Ergonomics deals with the design and the arrangement of the workstation so that the employees and the equipment will interact most effectively and safely. Table I on the following page summarizes the data which was presented on the questionnaires.

TABLE I

ERGONOMICS RELATED TO VDT OPERATORS (N=55)

Working Conditions	Number of Employees Yes	No
Light design suitable for working on a VDT?	40	13
Desk height adjustable?	33	22
Chair adjustable?	54	1
Chair supports lower back?	39	16
Keyboard separate from the monitor?	49	6
Keyboard lower than a normal desk height?	32	23
Screen height below eye level?	40	15
Screen adjustable?	43	12
Copyholder adjustable?	34	21
Copyholder at the same level and angle as the screen?	31	24
Footrests available?	9	46

All supervisors indicated on their questionnaires that the workstations in their offices were furnished with equipment manufactured especially for video display terminals. While the majority of the employees were in agreement with their supervisors over the ergonomic design of their workstations, Table I does reveal that some of the employees do not seem aware of the adjustments that can be made in their workstations.

While forty employees (75 percent) responded that the light design was suitable for working on a VDT, only twenty-eight employees (52 percent) stated in the very next question that they would rate the lighting in their office as good. Two employees (4 percent) indicated that the light was too dim while twenty-four employees (44 percent) indicated that there was too much glare at their workstations. One employee stated on her questionnaire that "A lot of light but desks are not positioned properly to utilize the lighting."

The response to the employee's desk height reveals that only thirty-three employees (60 percent) can adjust their desks. One supervisor stated that the desk heights could be adjusted but the adjustment was very time consuming.

All but one employee had adjustable chairs. However, only thirty-nine employees (71 percent) responded that their chairs supported their lower backs. In regard to Question No. 6 on the questionnaire, only thirty-five employees (65 percent) responded that their chairs were comfortable while the remaining nineteen employees (35 percent) responded that their chairs were uncomfortable. In fact, one employee stated that her chair was "New," but she added that the adjustment levers do not work and that her chair is the most uncomfortable chair she has had in several jobs. Another employee in a different company remarked that "Within the last month we purchased new chairs with the proper back support and I have noticed a big difference in the way I have felt at the end of the work day. This improved my aches and pains significantly at the end of the day."

Forty-nine employees (89 percent) stated that their keyboards were separate from the monitor. Research indicates that this enhances the workstation and leads to fewer health problems. On the question concerning the relationship of keyboard height and normal desk height, thirty-two employees (58 percent) indicated the keyboards are lower. This, too, is consistent with good ergonomics.

In order to follow good ergonomic guidelines, the screen height should be below eye level and the researcher noted that forty employees (73 percent) had this feature at their workstations. Forty-three employees (78 percent) said, too, that their screens were adjustable.

While thirty-four employees (62 percent) stated that their copyholders were adjustable, only thirty-one employees (56 percent) stated that their copyholders were at the same level and angle as the screens. Employees would benefit in having the two at the same level since this would require less focusing and refocusing of the eyes.

Only nine employees (16 percent) had footrests available. If the employees are having problems with constant sitting or with their lower back or legs, footrests might help to alleviate these health problems.

Questions No. 7, 8 and 9 on the instrument pertained to stress that an employee might encounter when working on a VDT. Stress can be created when employees have production quotas to meet, lack communication with other employees, face monotonous and repetitive work, cope with heavy workloads, feel a lack of promotion and raise, and encounter problems with their supervisors. Table II, which follows on the next page, summarizes the employee perceived causes of stress that were indicated on the questionnaires.

TABLE II

STRESS RELATED PROBLEMS OF VDT OPERATORS (N=55)

Stress Related Problems	Number of Employees Never	Rarely	Occasionally	Frequently
Production Quotas	8	8	15	24
Lack of Communication with Other Employees	8	13	20	10
Monotonous/Repetitive Work	3	6	21	27
Heavy Workload	1	1	38	15
Lack of Promotion/Raise	11	16	8	20
Supervisor Problems	20	19	8	7

One of the disadvantages of VDT work is that the work can be very monotonous and repetitive. This is verified by the fact that this category ranked number one in the frequently column with twenty-seven employees (47 percent) indicating that they did find their work to be monotonous and repetitive. Another twenty-one employees (37 percent) found the work to be monotonous and repetitive at least occasionally. Two of the employees marked two different columns in this category, thereby indicating that they believed that monotonous and repetitive work should have been listed separately on the questionnaire.

Research shows that production quotas can be a problem with VDT operators. Table II shows that twenty-four employees (43 percent) experience this stress frequently while another fifteen employees (27

percent) surveyed experience this stress occasionally. In the supervisors' questionnaires, over half replied that their departments do not monitor keystrokes. One department that does not monitor keystrokes does, however, monitor documents. One supervisor commented that this could be a cause of stress for the employees.

Lack of promotion/raise ranked the third highest marked category as a frequent problem for stress. It should be noted that about half of the employees (27 employees or 49 percent) indicated that this never or rarely caused them stress. One employee said that the raises were set by the corporation and that there was little or no chance for promotion within the department.

Another stress area that occurred occasionally for a number of the employees was found to be a heavy workload. While thirty-eight employees (69 percent) indicated that they experienced this occasionally, fifteen employees (27 percent) indicated that this was a frequent problem for them. Only two employees (4 percent) responded that they never or rarely faced a heavy workload. By adding the occasionally and frequently columns under heavy workloads, the researcher found that this category outranked all others for creating stress while operating a VDT.

Lack of communication with other employees was almost equally divided between the columns never or rarely and the columns occasionally or frequently. Twenty-six employees (46 percent) marked never or rarely while thirty employees (54 percent) marked occasionally or frequently. Seven of the ten employees who indicated this to be a frequent cause of stress were from the same company. Again, one employee marked two different columns under this category.

Thirty-nine or the majority of employees (72 percent) stated that they never or rarely experienced supervisor problems. Only fifteen employees (28 percent) indicated that they experienced stress with their supervisors either occasionally or frequently. The majority of employees who indicated that they experienced this stress frequently were again from the same company.

Table III summarizes how many times an employee marked the frequently column in Table II.

TABLE III

SUMMARY OF RESPONSES FOR
FREQUENTLY REPORTED STRESS PROBLEMS (N=55)

Number of Categories Marked	Number of Employees	Percent of Employees*
0	11	20
1	12	22
2	17	31
3	9	16
4	2	4
5	2	4
6	2	4

*Due to rounding, the percent column exceeds a sum of 100 percent.

Eleven employees (20 percent) indicated that they do not experience any of the stress categories listed on the survey instrument and another twelve employees (22 percent) experience stress in at least one of the

categories. Therefore, a little over half (32 employees or 59 percent) of the employees do experience stress frequently in two or more of these stress categories. In fact two employees marked all six stress categories and another two employees marked five. It was noted that all four of these employees, plus one employee who marked four of the categories, were from the same department.

Even though many employees indicated that they experienced stress either occasionally or frequently in the above categories, thirty employees (55 percent) responded that they would rate their overall office environments as only somewhat stressful. Twenty employees (36 percent) even felt that their overall office environments were pleasant. Only five employees (9 percent) felt that their situations were very stressful.

Although employees indicated feeling job-related stress, forty-six employees (84 percent) had not lost time from their work due to the above stressful situations. Although a space was provided for the remaining nine employees (16 percent) to give reasons for their lost time, very few responded. One employee stated that she felt she had lost time from work due to overtime pressures. Another employee felt that her lost time was due to stressful situations in the office. All other comments are included in Appendix C.

Question No. 10 was provided to deal with the work/coffee breaks that the employees are allowed each day. Only fifty employees responded to this question. Forty-two employees (84 percent) have a work/coffee break every two hours or once in the morning and once in the afternoon. It is noted that three employees (6 percent) said that they were not allowed a work/coffee break at all and five employees (10 percent) stated

that the work/coffee breaks depended on the intensity of the work. When the supervisors were asked if they felt that employees who work at video display terminals need a work/coffee break at more frequent intervals than employees in other positions, half of the supervisors responded yes and half responded no.

Table IV contains a summary of the data that was obtained from the

TABLE IV

HEALTH RELATED PROBLEMS OF VDT OPERATORS (N=51)

Health Problems	Number of Employees Never	Rarely	Occasionally	Frequently
Eyestrain	2	9	27	11
Headaches	8	12	22	9
Nausea/Dizziness	32	11	5	0
Muscle Strain-- Back Pain	7	12	20	10
Neck Pain	6	8	25	11
Shoulder Pain	10	12	22	7
Arm Pain	21	15	10	1
Wrist Pain	18	13	14	2
Finger Pain	25	11	8	1
Exhaustion or Severe Fatigue at Day's End	4	15	23	8
Problems from Constant Sitting	4	17	20	10

responses to Question No. 11. This question was included to deal with health problems that the employee might encounter while working at a VDT. Health problems included eyestrain, headaches, nausea and dizziness, muscle strain and problems from constant sitting. Only fifty-one employees responded as four employees failed to complete the second page of their questionnaire. Some employees responded in more than one column for a category and some employees did not respond in all categories.

Table IV indicates that eyestrain is the number one health problem while working on a VDT. One employee stated that "Eyes have gone downhill drastically." Thirty-eight employees (78 percent) do experience eyestrain either occasionally or frequently thus showing that this is a real concern to the word processing employees. One supervisor noted that "Eyes should be a serious concern for people operating VDT's."

Along with the eyestrain, thirty-one employees (61 percent) experience headaches occasionally or even frequently. Only eight employees (16 percent) stated that they never have headaches.

Even though other research questionnaires listed nausea/dizziness as a health problem, only five employees (10 percent) experience this occasionally in the Topeka area. Not one employee responded that he/she experience nausea or dizziness frequently. In fact, thirty-two employees (67 percent) stated that they had never had this health problem in connection with working at a VDT.

In relation to muscle strain, neck pain was the main health problem with eleven employees (22 percent) experiencing it frequently. Back pain followed with ten employees (20 percent) experiencing it frequently. Both of these categories showed a high ranking in the occasionally column, too.

Shoulder pain was listed by twenty-two employees (43 percent) as occurring occasionally. Seven employees (14 percent) seemed to experience this problem frequently.

The three health problems which are experienced the least frequently are arm, wrist and finger pain. Wrist pain was only experienced frequently by two employees (4 percent). In fact, eighteen employees (38 percent) never experience wrist pain and another thirteen employees (28 percent) experience it rarely. Wrist pain could be caused by the improper positioning of the keyboard and by high quota standards. Arm pain was never experienced by twenty-one employees (45 percent) and another fifteen employees (32 percent) rarely experienced this problem. In fact, only one employee (2 percent) experienced it frequently. Twenty-five employees (56 percent) never had finger pain and an additional eleven employees (24 percent) stated that they experienced finger pain only rarely. Again, only one employee (2 percent) experienced this frequently.

Exhaustion or severe fatigue at day's end was experienced by thirty-one employees (62 percent) either occasionally or frequently. The researcher noted that four employees (8 percent) stated that they were never exhausted at the day's end, and even fifteen employees (30 percent) stated that they were rarely exhausted.

Problems from constant sitting can be a problem for VDT operators and over half (30 employees or 59 percent) of the employees responded that they experienced this occasionally or frequently.

Question No. 12 was provided for employees to list other health problems that they might be experiencing. Some employees are having

problems with their feet, legs, and back, and at least one has developed an ulcer. All comments are included in Appendix C.

Table V is based on fifty-one employees' responses. This Table summarizes the response in the frequently column of employees on items included in Table IV thus showing how many times an employee felt that health problems were faced frequently.

TABLE V

SUMMARY OF RESPONSES FOR
FREQUENTLY REPORTED HEALTH PROBLEMS (N=51)

Number of Categories Marked	Number of Employees	Percent of Employees*
0	25	49
1	11	22
2	3	6
3	3	6
4	5	10
5	1	2
6	2	4
7	1	2
8	0	0
9	0	0
10	0	0
11	0	0

*Due to rounding the sum of the percent column exceeds 100 percent.

Thia Table indicates that twenty-five employees (49 percent) responding do not face the listed health problems frequently. Another eleven employees (22 percent) face only one of the health problems frequently. Therefore, less than one-third (15 employees or 30 percent) of the employees surveyed experience health problems frequently in two or more of the categories.

In response to Questions No. 13-16 with regard to pregnancy, eighteen employees have not experienced any problems with pregnancy. Only one employee stated that she has had a problem with her pregnancies. This employee has had three children. Thirty employees said that this question was not applicable to them.

Eight employees (16 percent) have carried children to full term and one employee is expecting at the present time. Twelve children have been born without any major birth defects to the VDT operators. One employee has had three children born while working at the VDT and two employees have had two children. The supervisors responded on their questionnaires that no former employees in their departments had experienced a problem pregnancy or has had a child born to their employees with a major birth defect while working at the VDT's. Three of the supervisors responded that employees in their departments could transfer to another position if they wished while they were carrying a child.

Question No. 17 was provided to allow the employees to add any comments that might aid my research. These comments can be found in Appendix C.

On their questionnaires the supervisors listed the manufacturer of the video display terminals used in their offices. This list is provided in Appendix B. Software used in the offices were also listed and, again, can be found in Appendix B.

Since some research indicates that health problems encountered by VDT operators are caused more by the workstation than the actual video display terminal, the supervisors were asked how they would respond to a question on this subject. They were equally divided on the effects of the VDT compared to the effects of the workstation on the employee. The supervisors were also equally divided when asked if they felt that employees who use proper keyboarding techniques experienced fewer health problems. The comments from the supervisors' questionnaires are found in Appendix B.

CHAPTER V

SUMMARY AND CONCLUSIONS

The results reported in Chapter IV pertain to the ergonomics, stress and health problems of VDT operators in nine word processing departments in Topeka, Kansas. All word processing departments surveyed are furnished with equipment manufactured especially for the video display terminals. This was reported in the supervisors' questionnaires. However, the employees' questionnaires showed that while a majority of the employees indicated that they have the correct ergonomic design in their departments, other employees either do not have the correct ergonomic design at their workstations or else they are not aware of the potential of their workstations.

While three-fourths (40 employees or 75 percent) of the employees said that the light design was suitable for their work, only a little over half (28 employees or 52 percent) responded that the lighting in their offices was good. The remainder of the employees indicated that the light was too dim or had too much glare. Inappropriate room lighting for VDT's could be the cause of this glare. Glare on the screen probably accounts for more eyestrain than any other factor for the VDT operator. Other health complaints may be aggravated by glare as the employee will move his/her head and body into awkward positions in an attempt to minimize the effects of the glare. Research indicates that lighting for the VDT operator should be about half that needed in an office without terminals. Improper lighting problems can create the eyestrain and headaches that employees noted in Table IV.

Proper desk height is essential at a workstation for the VDT user. Almost two-thirds (33 employees or 60 percent) of the employees stated that their desk heights were adjustable. Therefore, a majority of the employees can adjust the desk to each individual's preference. If the desk height is not at the proper position for each individual employee, health problems may occur. If the VDT height is too high, the employees may suffer back pains; and if the VDT is too low, the employees are forced to sit in an awkward position to view the display screen.

Fifty-four employees (98 percent) said that their chairs were adjustable, but not quite three-fourths (39 employees or 71 percent) of them indicated that their chairs supported their lower backs. Either the chairs cannot be adjusted adequately or else the individual employee does not know how to adjust his/her chair to fit properly. Research indicates that all chairs should be readily adjustable for both the terminal and the keyboard heights. The ideal chair should let the employee adjust it while the employee is sitting in the chair. If the chair does not support the lower back, the employee may experience health problems in the lumbar region. As noted by one employee, a properly fitting chair made a large difference in the way she felt at the end of the day. When the chair is properly adjusted, the VDT operator should be able to sit comfortably for a full day.

While a large majority of employees (49 employees or 89 percent) had their keyboards separate from the monitors, only a little over half (32 employees or 58 percent) had the keyboards lower than a normal desk. It is true that the keyboard should be detachable, thereby allowing independent adjustment by each employee. Research also indicates that the

keyboard height should be at or about even with the elbow height. If it is significantly higher or lower, an employee may experience repetitive strain injuries to their wrists. A properly placed keyboard can minimizes health problems in the arms, wrists and fingers. It is noted that while a number of the keyboards were at a higher level, very few employees were having health problems in these three areas.

Almost three-fourths of the employees (40 employees or 73 percent) stated that their screen height was below eye level, and a little over three-fourths (43 employees or 78 percent) stated that their screen was adjustable. If the screen is too high or too low, again the operator is forced to sit in an awkward position to view the display. This can be another cause for muscle strain.

Only a little over half (31 employees or 56 percent) of the employees had copyholders at the same level and angle as their screens. A few more employees (34 employees or 62 percent) did state that their copyholders were adjustable. The positioning of the copyholder could be part of the health problem that employees are experiencing with their eyes. If the copyholder is at the same level and angle as the screen, the employees will not have to focus and refocus their eyes as frequently, thus relieving eyestrain and headaches. Too, when the copyholder is positioned correctly, the number of head and neck movements are reduced; and, thereby, muscular strain on the neck, shoulders and back are reduced.

Footrests were available to less than one-fifth (9 employees or 16 percent) of the employees. Footrests enable the employees to raise

their knees which help to relieve lower back pressure. This is the only weakness that was observed in a majority of the departments.

The questionnaire obtained data that indicated that word processing employees seem to show many of the same stresses that have been documented in other studies. Although four-fifths (44 employees or 81 percent) of the employees are experiencing stress in one or more of the categories surveyed, few employees indicated that this stress was enough to force them to be absent from work.

The most frequently indicated stress with almost half (27 employees or 47 percent) of the employees responding dealt with the monotonous and repetitive work of VDT's. Very few employees (3 employees or 5 percent) responded that they were never involved in monotonous or repetitive work. This is one stress that seems to be experienced by most word processing employees in any business office.

Production quotas were also faced by a number of the employees (24 employees or 43 percent) frequently. Although half of the supervisors stated that their departments do not monitor keystrokes, most employees indicated that they have a high standard of production to meet.

A little over one-third of the employees (20 employees or 36 percent) responded that they face stress in the area of promotions and raises frequently. The promotion and raises are set by the company in most of these departments. Some of the raises and promotions are based on production standards that the employee must meet. While this is not a concern to some employees, other employees are unable to meet the standards thus causing them stress.

A heavy workload was experienced by fifteen employees (27 percent) frequently and thirty-eight employees (69 percent) occasionally. In fact only two employees (4 percent) responded that they never or rarely faced this stress on the job. The heavy workload and production quotas do cause stress in word processing employees. It was noted in the review of literature that many supervisors do expect employees to produce more when they are using VDT's and, therefore, the demands on the employees do increase.

The lack of communication with other employees in their offices was experienced by only ten employees (18 percent) frequently. Research does stress that the VDT operator needs to talk to co-workers. The employee needs to interact with other people, as well as with their computers, during the day. The researcher noted that most of the employees in one of the word processing departments had responded that this was a frequent cause of stress.

The only category where employees responded never or rarely over 50 percent of the time dealt with supervisor problems. There seemed to be very little problems that create stress between the employees and their supervisors. In fact, almost three-fourths (39 employees or 72 percent) of the employees never or rarely encountered stress in this area. Seven employees (13 percent) did feel that they had to deal with this stress frequently. Again the majority of these employees were from the same department.

While four-fifths of the employees (44 employees or 81 percent) did experience stress frequently in one or more of the categories as indicated in Table III, only five employees (9 percent) indicated that their

offices were very stressful. Thirty employees (55 percent) indicated that their offices were somewhat stressful and twenty employees (36 percent) found their workplace to be pleasant. Less than one-fifth of the employees (9 employees or 16 percent) have lost time from their work due to this stress.

All but three employees (6 percent) seem to be able to take work/coffee breaks at regular intervals during the day. The three employees that were unable to take a work/coffee break during the day did indicate on their questionnaires that they were under a lot of stress frequently in a majority of the categories listed in Table II. While the work/coffee breaks seem adequate for the majority of the employees in the Topeka area, VDT operators who are doing repetitive work which requires a high keying rate should be allowed a rest break after each hour of work.

The majority of the health problems seem to occur rarely, or at the most, only occasionally for the employees. In Table V, thirty-six employees (71 percent) responded that they were never faced with any of the health problems or only one of the health problems on a frequent basis.

Eyestrain seems to be the number one health problem for the VDT operators. Over three-fourths of the employees (38 employees or 78 percent) experience it occasionally or frequently. This eyestrain could be related to a number of reasons. Too much glare would definitely cause eyestrain as would copyholders at the incorrect level and angle. Uncorrected vision problems may exist and/or improper eyeglass prescriptions can force an employee to crane his/her neck to view the

screen. Some VDT operators experience vision problems from their first day on a terminal. This could mean that they had minor, undetected vision problems--such as slight nearsightedness--that did not show up until they started working on a VDT. Uncorrected vision problems or improper eyeglass prescriptions can also contribute to musculoskeletal ailments.

Not only did employees experience eyestrain but they indicated that they are experiencing headaches. Over three-fifths (31 employees or 61 percent) indicated that they had headaches occasionally or even frequently. Headaches and eyestrain are the two major health problems that employees are encountering in these departments.

Although other research has listed nausea/dizziness as a health problem, those in the Topeka area rarely encounter it. About two-thirds of the employees (32 employees or 67 percent) responded that they never experience this problem.

The categories dealing with muscle strain varied for each individual employee. Neck pain was the highest in the frequently column (11 employees or 22 percent) as well as in the occasional column (25 employees or 50 percent). Neck problems can stem from the improper positioning of the employee in front of the VDT.

Back pain was second in health problems under muscle strain. One-fifth (10 employees or 20 percent) had back pain frequently and a little over two-fifths (20 employees or 41 percent) had back pain occasionally. Shoulder pain was the third muscle strain problem with seven employees (14 percent) experiencing it frequently and another twenty-two employees (43 percent) experiencing it occassionally. These three health

problems--neck, back and shoulders--are affected by the design of the equipment and the posture of the employee.

The arm, wrist and finger pain were seldom indicated as a health problem. Arm pain and finger pain were never or rarely experienced in over three-fourths of the employees (arm--36 employees or 77 percent, and finger--36 employees or 80 percent). The wrist pain was not far behind with two-thirds (31 employees or 66 percent) of the employees again showing that they never or rarely experienced this problem.

Exhaustion or severe fatigue at day's end was experienced by over half (31 employees or 62 percent) of the employees either occasionally or frequently. Four employees (8 percent) noted that they were never exhausted at the day's end. An additional fifteen employees (30 percent) responded that they were rarely exhausted at the end of the day. While this is a health problem with VDT operators, the researcher feels that any employee in any field may experience exhaustion or severe fatigue by the end of the day.

Over one-half (30 employees or 59 percent) of the employees did experience problems from constant sitting either occasionally or frequently. Again this is a common problem for VDT operators. Proper workstation design and the employee's posture can help to alleviate this problem as well as work/rest breaks away from the VDT.

Pregnancy seemed to pose no problem with the VDT operators in the Topeka area. Eight employees have carried their children to full term. Three of these employees have had more than one child while working at the VDT's. Only one employee has had a problem with her pregnancy and this was reported by the employee who has had three children while

working at a VDT. There were no birth defects in any of the children. The supervisors also stated that no employee in the past has had a problem with pregnancy while working in the departments. Thirty employees stated that this was not applicable to them.

The majority of questionnaires were completed by employees who spend 30 to 40 hours a week or over on the VDT's. While a number of the employees experienced heavy workloads and production quotas, not quite half (22 employees or 44 percent) of the employees do experience less pressure on the VDT's than on an electric/electronic typewriters while over one-third (19 employees or 38 percent) experienced about the same pressure. One employee even stated that "Once you have worked on a Word Processor, you will never want to go back to a typewriter. They can do so many different things and make the work a lot faster and easier!!" Another commented "Unless you love to sit and type all day Word Processing is not for you. I like my job, but that's because I like to sit at a desk and type, but most people find it monotonous, dull, maybe, and tiresome."

While VDT operators in the Topeka area are experiencing some of the stress and health problems that seem to appear wherever employees work at a VDT, the majority of the employees responded that their health was the same or better than before they started working in their departments. Table IV revealed that health problems do not seem to be a major problem for three-fourths of the employees in each of the listed categories. Eyestrain and neck pain are the only health problems that rated over 20 percent in the frequently column--eyestrain with 23 percent and neck pain with 22 percent. Table V indicated that twenty-five employees

(49 percent) do not experience any of the listed health problems frequently while another eleven employees (22 percent) face only one health problem frequently. Therefore, a majority (36 employees or 71 percent) of the employees indicated that they do not have problems with a majority of the health problems covered in this study.

Table II revealed that stress does seem to be a major problem for the employees in a majority of the categories listed. Stress was experienced frequently by the employees in the following categories: monotonous/repetitive work--47 percent; production quotas--43 percent; lack of promotion/raise--36 percent and heavy workload--27 percent. Table III showed that only eleven employees (20 percent) did not experience any of the listed stress frequently and another twelve employees (22 percent) experienced stress frequently in only one category. Therefore, the majority of employees (32 employees or 58 percent) are facing stress frequently in most of the stress areas covered in this study.

The researcher feels that the word processing departments in the Topeka area have incorporated the ergonomic designs into their workstations. Though stress does seem to be a major concern of a majority of the employees, health problems do not seem to pose a problem for the majority of the employees or to their supervisors at the present time.

CHAPTER VI

RECOMMENDATIONS

Good ergonomics offers many solutions to the potential health problems found in offices that use video display terminals. Simple improvements in the working conditions at video display terminals can prevent some of the most common health problems. The researcher does feel that not all employees surveyed are taking full advantage of their workstations. Since improper use of equipment can cause numerous health problems, all employees need to be made aware of the following recommendations.

Lighting--Achieving the optimum office lighting system is an investment that does pay dividends in both worker satisfaction and productivity. Glare results from inappropriate room lighting. It has been recommended that lighting for VDT departments be about half that needed in an office without terminals. To reduce glare, station the screen so that the operators will not see bright surfaces such as windows, glossy or shiny surfaces or surfaces with a large area of contrast. Often overlooked areas that produces glare includes the surface of the desk, the walls and even the keyboard. All of these surfaces should be non-reflecting and, if possible, non-white colors. Shield windows with curtains, shades or blinds. Install indirect lighting that is correctly designed for screen viewing.

Desks--The desk height influences the height of the arms, wrists and hands, as well as the wrist and neck angles. Therefore, all desks should be readily adjustable for both the terminal and the keyboard

height. Desk heights should be four to six inches lower than a normal desk height. If possible, the desk should allow the adjustment of the keyboard height independently of the main worksurface.

Chairs--A properly designed chair will support the back and legs and indirectly support the head, neck and arms. All chairs should have easily adjustable back, seat and height features. The ideal chair should allow the employee to make all adjustments while he/she is sitting in the chair. The back of the chair should give support to the lumbar region of the lower back by pressing firmly against the lower back. The seat pan should be wide enough to give comfortable support to the body. It, too, should provide firm support. The chair should be adjusted so that the operator's feet rest flat on the floor. The proper height should allow the arms and hands to be parallel to the floor. The chair should be padded or upholstered.

Keyboard--The keyboard should be detachable to allow independent adjustment so that the operator can maintain a safe and comfortable viewing and typing position at all times. The keyboard should be lower than a normal desk height. It should be positioned so only a soft touch is required for keying. The home row of the keyboard should be at the worker's elbow height, allowing the forearm to be parallel to the floor.

Screen--The screen should be positioned 20 degrees below eye level and should be 18 to 24 inches away from the eyes. Employees may suffer back pain if the screen is too high or too low which forces the operator to sit in an awkward position to view the display. The screen needs to be adjustable to maintain proper readability levels. The operator should be able to adjust the contrast and brightness of the screen to

moderate levels. The screen should be shielded from direct light, kept clean and well maintained.

Copyholder--The copyholder should be at the same level and angle as the screen. This level cuts down the focusing and refocusing of the eyes and minimizes the tiring adjustments of the head's position. The copyholder must be properly illuminated.

Footrests--Footrests should be available for any employee who wishes to use one. Footrests are used to raise the knees and to relieve low back pressure. When the footrest is a pivoting one, the employee is assured of slight, frequent movements for the legs and ankles to stimulate blood circulation.

The prevention of health problems depends largely on educating the employees to take advantage of the ergonomic design of their workstations. It is critical that all employees are made aware of the ergonomics that their offices provide.

By following the above recommendations, word processing employees in the Topeka area should experience fewer of these health-related problems. With the constant changes in VDT equipment and knowledge, there is a need to continue to study these problems. It would be wise to replicate this study at a future date.

APPENDIX A

Pittsburg State University
Technical Education Center
Pittsburg, Kansas 66762 • 316/231-7000, Ext. 4632; Kans-a-n 566-4632

May 19, 1989

Word Processing Supervisor
Company
Street Address
City, State ZIP

VDT/WORKPLACE STUDY

While visiting Word Processing Departments in the Topeka area during the past four summers with a group of teachers from Emporia State University, I was very impressed with your department. I am a business teacher at Yates Center High School. As more and more offices are becoming computerized, questions are being raised about the effects of video display terminals on office workers. In order to prepare my students for their future work environment, I would like to ask your help.

I am working on a Masters Degree in Business Technical Education at Pittsburg State University. My thesis topic concerns the work environment for word processing employees in the Topeka area. Attached you will find a copy of the cover letter and the survey questionnaire that I would like your word processing employees to complete.

All information in this questionnaire is guaranteed to be kept strictly confidential. The information will be used as part of a larger research project. The information compiled from the survey questionnaire that your employees complete will be combined with similar information from several other companies in the Topeka area. Results of the total survey will be made available upon request.

Will you help me to conduct my research by letting your employees take part in this survey? If so, please fill in the attached form and return it to me in the enclosed envelope. I will then mail the number of surveys that you need and will come to Topeka to pick up the completed surveys at a later date.

Thank you for your help in my research.

Carolyn A. Clark
Yates Center High School
Business Teacher
Pittsburg State University
Graduate Student

Dr. Frank M. Slapar
Graduate Advisor
Pittsburg State University

Pittsburg State University
Technical Education Center
Pittsburg, Kansas 66762 • 316/231-7000, Ext. 4632; Kans-a-n 566-4632

May 19, 1989

Word Processing Supervisor
Company
Street Address
City, State ZIP

VDT/WORKPLACE STUDY

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Thank you for your help in my research.

Carolyn A. Clark
Yates Center High School
Business Teacher
Pittsburg State University
Graduate Student

Dr. Frank M. Slapar
Graduate Advisor
Pittsburg State University

VDT/WORKPLACE STUDY

_____ Yes, I will help you conduct your survey.

I will need _____ copies of the survey.

_____ No, I cannot help you with your studies.

_____
Word Processing Supervisor

_____
Company

Pittsburg State University
Technical Education Center
Pittsburg, Kansas 66762 • 316/231-7000, Ext. 4632; Kans-a-n 566-4632

May 30, 1989

Supervisor's Name
Word Processing Supervisor
Company Name
Address
City, State ZIP

VDT/WORKPLACE STUDY

Thank you for your assistance with my research. Enclosed you will find (insert number) copies of the survey questionnaire for your word processing employees. The employee's name should not be placed on the questionnaire nor should the company name be indicated.

I am also enclosing a short questionnaire for your consideration. If you will complete this questionnaire, the information will help me in both my research study and in my classroom.

I will be in Topeka on Wednesday, June 7, to pick up the completed questionnaires.

Carolyn A. Clark
Yates Center High School
Business Teacher
Pittsburg State University
Graduate Student

SURVEY OF WORD PROCESSING SUPERVISORS

1. MAKE OF VIDEO DISPLAY TERMINALS USED IN YOUR OFFICE: _____ _____.

2. NAME OF SOFTWARE USED IN YOUR OFFICE: _____ _____.

3. ARE THE WORKSTATIONS IN YOUR OFFICE FURNISHED WITH EQUIPMENT MANUFACTURED ESPECIALLY FOR VIDEO DISPLAY TERMINALS? _____ YES; _____ NO.

4. DO YOU FEEL THAT EMPLOYEES WHO WORK AT VIDEO DISPLAY TERMINALS NEED A WORK/COFFEE BREAK AT MORE FREQUENT INTERVALS THAN EMPLOYEES IN OTHER POSITIONS? _____ YES; _____ NO.

5. DO YOU FEEL THAT ANY HEALTH PROBLEMS EXPERIENCED BY WORD PROCESSING EMPLOYEES ARE RELATED MORE TO THE WORKSTATIONS THAN TO THE VIDEO DISPLAY TERMINALS? _____ YES; _____ NO.

6. DO EMPLOYEES WHO USE PROPER KEYBOARDING TECHNIQUES EXPERIENCE FEWER HEALTH PROBLEMS? _____ YES; _____ NO.

7. DOES YOUR DEPARTMENT MONITOR KEYSTROKES? _____ YES; _____ NO. IF SO, DO YOU FEEL THAT THIS IS A CAUSE OF STRESS FOR THE EMPLOYEES? _____ YES; _____ NO.

8. HAVE ANY FORMER EMPLOYEES EXPERIENCED A PROBLEM PREGNANCY OR HAD A CHILD BORN WITH MAJOR BIRTH DEFECTS? _____ YES; _____ NO.

9. ARE YOUR EMPLOYEES ALLOWED TO TRANSFER TO OTHER POSITIONS IF THEY WISH WHILE THEY ARE CARRYING A CHILD? _____ YES; _____ NO.

10. COMMENTS THAT MIGHT AID MY RESEARCH _____

_____

_____.

Pittsburg State University
Technical Education Center
Pittsburg, Kansas 66762 • 316/231-7000, Ext. 4632; Kans-a-n 566-4632

May 30, 1989

VDT/WORKSTATION STUDY

Attached to this letter you will find a survey questionnaire that is being used as an instrument to gather information about the work environment that affects the video display terminal operators in word processing departments in the Topeka, Kansas, area.

This survey questionnaire is part of a larger research project which is intended to identify the extent ergonomics is being used in the word processing departments in the Topeka area.

All information that you supply is guaranteed to remain confidential. Your information will be combined with information from other word processing departments in the area. Complied results will be available to you upon request by writing directly to me.

I would appreciate it if you would complete the survey questionnaire. Thank you very much for your help in my research.

Carolyn A. Clark
Business Teacher
Yates Center High School
Graduate Student
Pittsburg State University

Dr. Frank M. Slapar, Director
Graduate Studies
Pittsburg State University

SURVEY OF WORD PROCESSING EMPLOYEES

1. WOULD YOU RATE YOUR OVERALL HEALTH AS: _____ BETTER: _____ WORSE; _____ THE SAME AS IT WAS BEFORE YOU WERE EMPLOYED AT YOUR PRESENT JOB?

2. HOW MANY HOURS DO YOU WORK AT A VIDEO DISPLAY TERMINAL (VDT) EACH WEEK? _____ LESS THAN 20; _____ 20 TO 30; _____ 30 TO 40; _____ 40 AND OVER.

3. IF YOU HAVE WORKED BOTH AS AN EMPLOYEE ON AN ELECTRIC/ELECTRONIC TYPEWRITER AND ON A VDT, DO YOU FEEL _____ MORE PRESSURE; _____ LESS PRESSURE; _____ ABOUT THE SAME PRESSURE ON THE VDT AS ON THE TYPEWRITER.

4. IS YOUR WORKSTATION ERGONOMICALLY (THE DESIGN AND ARRANGEMENT OF THE WORKSTATION SO THAT EMPLOYEES AND EQUIPMENT WILL INTERACT MOST EFFECTIVELY AND SAFELY) REGULATED?

	YES	NO
LIGHT DESIGN SUITABLE FOR WORKING ON A VDT?	___	___
DESK HEIGHT ADJUSTABLE?	___	___
CHAIR ADJUSTABLE?	___	___
CHAIR SUPPORT YOUR LOWER BACK?	___	___
KEYBOARD SEPARATE FROM THE MONITOR?	___	___
KEYBOARD LOWER THAN A NORMAL DESK HEIGHT?	___	___
SCREEN HEIGHT BELOW EYE LEVEL?	___	___
SCREEN ADJUSTABLE?	___	___
COPYHOLDER ADJUSTABLE?	___	___
COPYHOLDER AT THE SAME LEVEL AND ANGLE AS THE SCREEN?	___	___
FOOTRESTS AVAILABLE?	___	___

5. HOW WOULD YOU RATE THE LIGHTING IN THE OFFICE? _____ GOOD; _____ TOO DIM; _____ TOO MUCH GLARE.

6. HOW WOULD YOU RATE YOUR CHAIR? _____ COMFORTABLE; ____ UNCOMFORTABLE.

7. DO YOU EXPERIENCE ANY OF THE FOLLOWING PROBLEMS THAT WOULD DEAL WITH STRESS ON YOUR JOB?

	NEVER	RARELY	OCCASIONALLY	FREQUENTLY
PRODUCTION QUOTAS	___	___	___	___
LACK OF COMMUNICATION WITH OTHER EMPLOYEES	___	___	___	___
MONOTONOUS/REPETITIVE WORK	___	___	___	___
HEAVY WORKLOAD	___	___	___	___
LACK OF PROMOTION/RAISE	___	___	___	___
SUPERVISOR PROBLEMS	___	___	___	___

8. HOW WOULD YOU RATE YOUR OVERALL OFFICE ENVIRONMENT? _____ VERY STRESSFUL; _____ SOMEWHAT STRESSFUL; _____ PLEASANT.

9. HAVE ANY OF THE ABOVE CAUSED YOU TO LOSE TIME FROM YOUR WORK? _____ YES _____ NO. IF YES, PLEASE EXPLAIN _____

_____

10. How often are your work/coffee breaks a day? _____ none;
_____ 1 every 2 hours; _____ 1 every 3 hours; _____ 1 morning;
_____ 1 afternoon; _____ depends on the intensity of the work.

11. Do you experience any of the following health problems as a result of your job?

	Never	Rarely	Occasionally	Frequently
Eyestrain	____	____	____	____
Headaches	____	____	____	____
Nausea/dizziness	____	____	____	____
Muscle strain--				
Back pain	____	____	____	____
Neck pain	____	____	____	____
Shoulder pain	____	____	____	____
Arm pain	____	____	____	____
Wrist pain	____	____	____	____
Finger pain	____	____	____	____
Exhaustion or severe fatigue at day's end	____	____	____	____
Problems from constant sitting	____	____	____	____

12. Other health problems (describe) _____

_____

13. While working at the VDT have you experienced a problem pregnancy?
_____ yes; _____ no; _____ not applicable.

14. While working at the VDT, have you carried child/children to full term? _____ yes; _____ no.

15. If yes, how many children? _____

16. If yes, were there any major birth defects in the child/children?
_____ yes; _____ no.

17. Additional comments that might aid my research: _____

_____

_____

APPENDIX B

SURVEY OF WORD PROCESSING SUPERVISORS

Question No. 1

Manufacturer of video display terminals used in the various offices.

Wang
Mega Data
IBM DisplayWriter
Data General D460
IBM 5520
IBM-PS30
PC's and IBM 5520 System

Question No. 2

Name of software used in the various offices:

Office Information Software
Penta
DisplayWriter
Data General Comprehensive Electronic Office
DisplayWrite 4 and Pagemaker
For word processing only the 5520

Comments to Question No. 10

Eyes should be a serious concern for people operating VDT's. Stress is another serious effect with regard to response time, monotonous, work, etc.

If employees sit at a terminal for hours at a time, my answers would be different. However, with printing, distributing, etc. no one in my office sits for long periods.

Training on various software is very important. Recognition of each employee's limitations is needed when introducing extremely complicated applications.

Individual and departmental accuracy and efficiency standards are utilized to rate their performance. Goals for length of service are set also. All desk heights for all 15 employees are adjustable as we have adjustable workstations and adjustable keyboard trays.

Some questions are not answered because the situation has not occurred.

APPENDIX C

SURVEY OF WORD PROCESSING EMPLOYEES

Comments to Question No. 9

We have too much overtime during certain times of the year that I get exhausted and run down. We are running with an understaffed department which causes alot (sic) of overtime, friction and stress.

Try to cope, but, sometimes the stress is overwhelming, especially when compounded by no-win situations.

Due to favoritism, the "pets" often set the fastest work increasing their productivity to levels much higher than the rest of us. Due to the stress of this rather degrading and frustrating situation, I have taken more "mental health" day (sic) than in the past. This also gives them larger raises and incentive bonuses.

Headaches from tension.

Comments to Question No. 12

Feet and legs swell.

Restricted circulation from sitting all day.

I'm being treated for a misaligned vertabrae (sic) at the present which may have been caused by a chair not adjusted to my body shape.

Even wearing glasses my eyes seem to have gotten worse. They don't focus well from looking at things up close to objects far away.

Leg stiffness.

Depending on the stress level, I sometimes have "ulcer" problems and have irritable bowel syndrome which is aggravated by stress--but I rarely miss work due to this.

Rear end is sore too.

Comments to Question No. 17

We need a free fitness program to attend to give us the exercise we need.

The only major problem I have w/the workstation is that most of us have no place to put our purses, etc. We only have 2 small drawers for supplies. Some of the cubicles have extra counter spaces and larger drawers.

Basically my health is very good. When I started working on VDT in 1980, my eyesight was 20/20. I am now into bifocals and I feel my eyesight has gone downhill because of working on the VDT.

Within the last month we purchased new chairs with the proper back support and I have noticed a big difference in the way I have felt at the end of the work day. This improved my aches and pains significantly at the end of the day. Before we had color monitors we had dark screens with green type and I experienced eyestrain frequently while using those. Now with the color monitors I very rarely experience eyestrain.

Unless you love to sit and type all day Word Processing is not for you. I like my job, but that's because I like to sit at a desk and type, but most people find it monotonous, dull, maybe, and tiresome.

Once you have worked on a Word Processor, you will never want to go back to a typewriter. They can do so many different things and make the work a lot faster and easier!!

We are not allowed breaks during our shift except lunch. I feel that we need to get away from the VDT every two hours to rest our eyes, neck, back, arms, etc. and our minds. To get away from the stress for awhile. The more stress the more tense I feel.

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